(19)日本国特許庁（JP）　(12)特　許　公　報（B2）　(11)特許出願公告番号

特公平7－60185

(24)(44)公告日　平成7年(1995)6月28日

(51)Int.Cl.*	識別記号	庁内整理番号	FI	技術表示箇所
G01V 3/08		D 9406-2G		

請求項の数2(全 4 頁)

(21)出願番号　特願平4－8705

(22)出願日　平成4年(1992)1月21日

(65)公開番号　特開平5－196743

(43)公開日　平成5年(1993)8月6日

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(56)参考文献　実開　昭58－82200（JP，U）
実開　昭53－92949（JP，U）
実公　昭41－23421（JP，Y1）

(54)【発明の名称】　着座センサ

【特許請求の範囲】

【請求項1】人が座る着座部の人体が近接する部分に取り付けられる検出電極と、上記着座部の人体が近接しない部分であり且つ検出電極と同一環境下に取り付けられる比較電極と、夫々の電極と大地との間の静電容量の差分の変化から人体の着座状態を検出する検出回路とを備えて成ることを特徴とする着座センサ。

【請求項2】人体が近接する方向以外の方向の静電容量結合を遮断するシールド電極を備えて成ることを特徴とする請求項1記載の着座センサ。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、人が座ったことを検出する着座センサに関するものである。

【0002】

【従来の技術】人が座ったことを検出する従来の着座センサとしては、導電ゴムを用い着座荷重により導電ゴムを導通させて着座状態を検出する荷重式のもの、あるいは光電センサを用い発光素子などからの光が人体で遮断されたことから着座状態を検出する光電式のものなどがある。この種の着座センサは、例えば、温水洗浄便座における使用状態の検出用、自動車、バス、飛行機あるいは列車などの着座検出用、もしくはホールや劇場などの着座検出用、さらにはマッージ椅子などに使用されている。

【0003】

【発明が解決しようとする課題】ところが、上記荷重式の着座センサでは、確実に着座状態を検出することができるようにするためには、取付位置が制約され、この導電ゴムの取付位置によっては使い心地が悪くなるという問題がある。しかも、その割りに確実に着座状態を検出することができず、信頼性に欠けるという問題があった。

【0004】また、光電式の着座センサの場合にも、取付位置に制約を受け、また外乱光等による誤動作が起こるという問題があった。本発明は上述の点に鑑みてなされたものであり、その目的とするところは、取付位置の制約が少なく、使い心地に影響を与えず、且つ確実に着座状態を検出できる着座センサを提供することにある。

【0005】

【課題を解決するための手段】本発明では、上記目的を達成するため、人が座る着座部の人体が近接する部分に取り付けられる検出電極と、上記着座部の人体が近接しない部分であり且つ検出電極と同一環境下に取り付けられる比較電極と、夫々の電極と大地との間の静電容量の差分の変化から人体の着座状態を検出する検出回路とを備えている。

【0006】また、必要な方向だけで着座状態を検出するために、人体が近接する方向以外の方向の静電容量結合を遮断するシールド電極を設けることが好ましい。

【0007】

【作用】本発明は、上述のように静電容量変化から人体の着座を検出することにより、検出電極と大地との間に人が介在することにより静電容量が変化する部分であれば、人体と検出電極との接触及び非接触状態であるとを問わずに、いかなる場所にも検出電極を取り付けることができ、このため取付位置の制約を少なくでき、しかも導電ゴムを用いた荷重方式のように人体に圧力を加える構造を何等備えないことにより、使い心地に影響を与えず、さらに荷重式の場合のように取付状態により大きく着座状態の検出感度が変動したり、光電式のように外乱光による誤動作を行うこともないことにより、確実な着座状態の検出が可能となる。

【0008】

【実施例】

（実施例1）図1乃至図4に本発明の一実施例を示す。本実施例では、本発明の着座センサを図4に示す温水洗浄便座Aに適用した場合を例として説明する。この温水洗浄便座Aは、洋式の水洗便器の便座の代わりに取り付け、温水を用いて用便後の局部の洗浄を行うことができるようにしたものである。この温水洗浄便座Aの操作は、便座30の一側部の肘掛け部31の上面に設けた操作部32のスイッチなどを操作すると、図示しない洗浄ノズルから温水が噴出され、局部の洗浄が行われる。

【0009】この種の温水洗浄便座Aでは、人が便座30に着座していない状態で、洗浄ノズルから温水などが噴出されることは好ましくない。そこで、人が便座30に着座しているときだけ、操作部32の操作が行えるようにするために、着座センサが用いられる。また、この種の温水洗浄便座Aとしては冬期において便座30を暖

房する機能を備えているものもあり、このような温水洗浄便座Aでは、不使用時にヒータの加熱状態を低くして消費電力を少なくし、使用時にヒータの加熱状態を高めるために、上記着座センサが用いられることもある。

【0010】さらに、上記着座センサは、用便後（人が便座30から離れたとき）、便座30に被せられたシートペーパを自動供給する機能を備えるものでは、そのシートペーパの供給制御のために用いられ、さらにまた消臭装置あるいは用便中の音消しのための水流音発生装置などを備えるものでは、着座時などにそれら装置を自動的に駆動するためにも用いられる。

【0011】

【0012】

【0013】

【0014】なお、検出電極1は大腿部や臀部が近接する部分以外に、例えば背もたれ部、または体側の部分などの着座によって人体Xが近接する部分に設けてもよい。また、人体Xと非接触で検出を行う場合には、検出電極1と検出物体Xとの間に絶縁物もしくは電気的に浮いた状態にある導電物が介在しても問題はない。さらに、検出電極は人体Xの近接部分に広範囲にわたり検出できるようにすることが好ましい。このようにする場合には図3に示すように複数の検出電極1を人体Xの近接部に配置し、夫々の検出電極1をリード線5でつなげばよい。なお、このようにしても検出回路2'_の構成は何等変える必要はない。

【0015】本実施例の着座センサとしては図1に示す差動遅延型の静電容量式着座センサを用いており、この着座センサは検出電極1のほかに、比較電極3を設け、夫々の電極1、3との大地との間の静電容量の差分から着座状態を検知するものである。ここで、この静電容量式着座センサの場合、検出電極1は人体Xの近接する部分に設け、比較電極は人体Xが近接しない部分に設ける。

【0016】この差動遅延型の静電容量式着座センサの検出回路2'は、パルス信号を発生するパルス発生回路21と、このパルス発生回路21の出力を検出電極1及び比較電極3とアースとの間の静電容量に応じて夫々遅延した出力を発生する可変遅延回路22_1，22_2と、夫々の可変遅延回路22_1，22_2の出力を波形整形する波形整形回路23_1，23_2と、夫々の波形整形出力を任意の量だけ遅延させて出力のオフセット調整を行う遅延調整回路24_1，24_2と、夫々の遅延調節回路24の出力の位相差を弁別する位相弁別回路25とで構成してある。

【0017】この着座センサでは、便器が使用されていないときには、検出電極1及び比較電極3の夫々と大地との間の静電容量によっては位相差が生じないようにしてある。いま、用便のために、人が便座30に座ると、人体Xが検出電極1と大地との間に介在するために、検

出電極1と大地との間の静電容量が変化する。一方、比較電極3と大地との間の静電容量は人体Xが便座に座ったときにもさほどに変化しない。このため、可変遅延回路22_1，22_2の出力の遅延料が大きく変化し、位相弁別回路25で位相差が検出され、この出力から温水洗浄便座Aのマイクロコンピュータなどからなる制御回路で人が着座したと判別される。つまり、この差動遅延型の静電容量式着座センサSでは、検出電極1側と比較電極3側の夫々の容量結合の相対的な差から着座検出を行うのである。

【００１８】ここで、上記比較電極3は検出電極1と同一の環境となる部分に配置する。このようにすれば、この差動遅延型の静電容量式着座センサSでは、検出電極1側と比較電極3側との夫々の容量結合の相対的な差を求めるので、温度等による影響が相殺され、検出出力のばらつきが少なくなる。さらに、上記静電容量式着座センサでは検出方向以外の望まれない方向からの静電容量変化を検知して誤動作を起こす可能性がある。そこで、人体X検出を行う以外の方向の静電容量変化を起こさせないようにするために、必要でない方向での静電容量結合を遮断するようにすればよい。

【００１９】その場合には検出電極1と必要でない検出方向との間にシールドを施せばよい。例えば、便座３０の便器や水滴を検出しない構造とするため、図5（a）に示すように検出電極1の下に接地したシールド電極4を配置する。このようにすれば、便座３０の下方の不要な静電容量結合を遮断して、必要な方向だけで着座検出が行える。さらに、図5（b）に示すようにシールド電極4で上方を除くすべての方向をシールドする構造とすればさらに好ましい。

【００２０】

【発明の効果】本発明は、上述のように人が座る着座部の人体が近接する部分に取り付けられる検出電極と、上記着座部の人体が近接しない部分であり且つ検出電極と同一環境下に取り付けられる比較電極と、夫々の電極と大地との間の静電容量の差分の変化から人体の着座状態を検出する検出回路とを備えているので、検出電極と大地との間に人が介在することにより静電容量が変化する部分であれば人体と検出電極との接触及び非接触状態であるとを問わずに、いかなる場所にも検出電極を取り付けることができ、このため取付位置の制約が少ないものであって、しかも検出電極及び比較電極と大地との静電容量の相対的な差分をとることにより環境変化などの同一要素を相殺する事ができ、環境変化に応じて着座状態の検出感度が変化することを防止できるという効果がある。

【００２１】

【００２２】さらに、人体が近接する方向以外の方向の静電容量結合を遮断するシールド電極を設けると、必要でない方向での静電容量結合を遮断して、必要な方向だけで着座状態を検出することができる。

【図面の簡単な説明】

【図１】本発明の一実施例の着座センサの回路図である。

【図２】同上の検出電極の配設方法の説明図である。

【図３】広範囲で人体が検出できるようにする場合の検出電極の配設方法の説明図である。

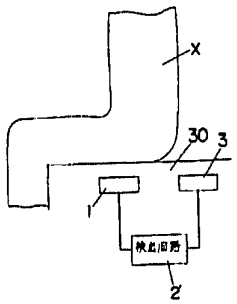
【図４】同上が適用される温水洗浄便座を示す斜視図である。

【図５】（a），（b）は不必要な方向での静電容量結合を防止する方法の説明図である。

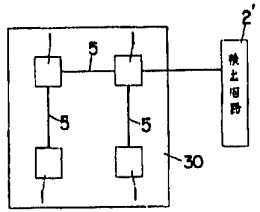
【符号の説明】

1　検出電極
2'　検出回路
3　比較電極
4　シールド電極
３０　便座
X　人体

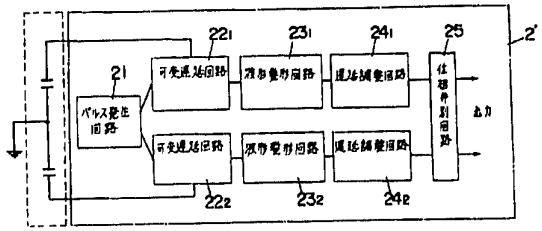
【図２】



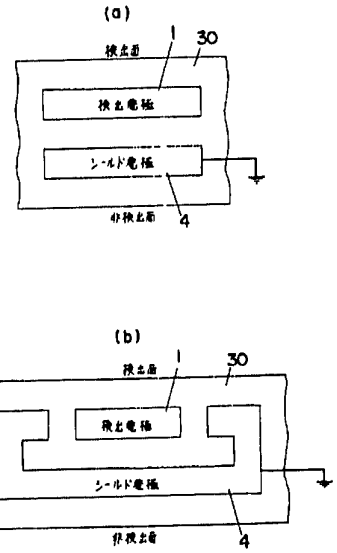
【図３】



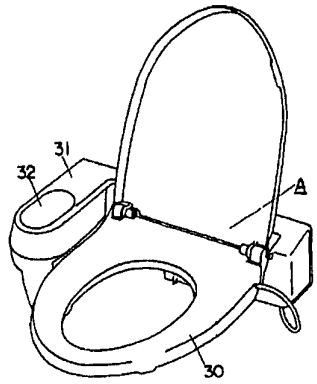
【図１】



【図５】



【図４】



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CLAIMS

[Claim(s)]
[Claim 1] The taking-a-seat sensor characterized by to be the part which the detection electrode attached in the part which the body of the taking-a-seat section with which people sit down approaches, and the body of the above-mentioned taking-a-seat section do not approach, and to have the detector which detects the taking-a-seat condition of the body, and to consist of change of the difference of the electrostatic capacity between a detection electrode, the reference electrode attached in the bottom of the same environment, and each electrode and earth.
[Claim 2] The taking-a-seat sensor according to claim 1 characterized by having the screening electrode which intercepts electrostatic-capacity association of the direction of [other than the direction where the body approaches], and changing.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the taking-a-seat sensor which detects that people sat down.
[0002]
[Description of the Prior Art] Since the light from a light emitting device etc. was intercepted in the body using load-type the thing or photoelectrical sensor which is made to flow through electrical conductive gum according to a taking-a-seat load, using electrical conductive gum as a conventional taking-a-seat sensor which detects that people sat down, and detects a taking-a-seat condition, there is a thing of the photoelectrical type which detects a taking-a-seat condition etc. This kind of taking-a-seat sensor is used for the MA&JI chair etc. by objects for taking-a-seat detection, such as objects for taking-a-seat detection, such as an object for detection of the busy condition in a toilet bowl warm water flush system, an automobile, a bus, an airplane, or a train, or a hole, and a theater, and the pan.
[0003]
[Problem(s) to be Solved by the Invention] However, by the above-mentioned load-type taking-a-seat sensor, in order to enable it to detect a taking-a-seat condition certainly, an attaching position is restrained and there is a problem that a usage feeling worsens depending on the attaching position of this electrical conductive gum. And a taking-a-seat condition could not be detected comparatively certainly, but the problem that dependability was missing existed.
[0004] Moreover, also in the case of a photoelectrical-type taking-a-seat sensor, constraint was received in the attaching position and there was a problem that malfunction by disturbance light etc. took place. It is few, and a usage feeling is not affected and the place which succeeds in this invention in view of an above-mentioned point, and is made into the purpose has constraint of an attaching position in offering the taking-a-seat sensor which can detect a taking-a-seat condition certainly.
[0005]
[Means for Solving the Problem] In this invention, in order to attain the above-mentioned purpose, it is the part which the detection electrode attached in the part which the body of the taking-a-seat section with which people sit down approaches, and the body of the above-mentioned taking-a-seat section do not approach, and has the detector which detects the taking-a-seat condition of the body from change of the difference of the electrostatic capacity between a detection electrode, the reference electrode attached in the bottom of the same environment, and each electrode and earth.
[0006] Moreover, in order to detect a taking-a-seat condition only in a required direction, it is desirable to prepare the screening electrode which intercepts electrostatic-capacity association of the direction of [other than the direction where the body approaches].
[0007]
[Function] This invention by detecting taking a seat of the body from electrostatic-capacity change as mentioned above If it is the part from which electrostatic capacity changes when people intervene between a detection electrode and the earth A detection electrode can be

attached in any locations, without asking ** which is in the contact to the body and a detection electrode, and a non-contact condition. For this reason, by being able to lessen constraint of an attaching position and not having at all the structure of moreover applying a pressure to the body like the load method using electrical conductive gum It becomes detectable [a positive taking-a-seat condition] by not affecting a usage feeling, not changing the detection sensitivity of a taking-a-seat condition sharply according to an attachment condition still like [in the case of a load type], or not performing malfunction by disturbance light like a photoelectrical type.
[0008]
[Example]
(Example 1) One example of this invention is shown in drawing 1 thru/or drawing 4 . This example explains as an example the case where it applies to the toilet bowl warm water flush system A which shows the taking-a-seat sensor of this invention to drawing 4 . This toilet bowl warm water flush system A is attached instead of the seat of the water closet of foreign style, and enables it to wash the part behind a stool using warm water. If actuation of this toilet bowl warm water flush system A operates the switch of the control unit 32 prepared in the top face of the armrest section 31 of one flank of the seat 30 etc., warm water will blow off from the washing nozzle which is not illustrated, and washing of a part will be performed.
[0009] In this kind of toilet bowl warm water flush system A, it is not desirable that warm water etc. blows off from a washing nozzle in the condition that people have not sat down to the seat 30. Then, only when people have sat down to the seat 30, in order to enable it to operate a control unit 32, a taking-a-seat sensor is used. Moreover, in order for there to be also a thing equipped with the function which heats the seat 30 in winter as this kind of a toilet bowl warm water flush system A, to make the heating condition of a heater low in such a toilet bowl warm water flush system A at the time of un-using it, to lessen power consumption and to raise the heating condition of a heater at the time of use, the above-mentioned taking-a-seat sensor may be used.
[0010] Furthermore, after a stool, the above-mentioned taking-a-seat sensor is used for supply control of the sheet paper, and by what is equipped with deodorization equipment or the stream sound generator of the ******** sake in a stool further again, also in order to drive these equipments automatically at the time of taking a seat etc., it is used at a thing equipped with the function which carries out automatic supply of the sheet paper put on the seat 30 (when people separate from the seat 30).
[0011]
[0012]
[0013]
[0014] In addition, the detection electrode 1 may be formed in the part which Body X approaches by taking a seat of the part by the side of for example, the back board section or the body etc. in addition to the part which a femoral region and a hip approach. Moreover, in detecting by Body X and non-contact, it is satisfactory even if the electric conduction object in an insulating material or the condition of having floated electrically intervenes between the detection electrode 1 and the detection body X. Furthermore, as for a detection electrode, it is desirable to enable it to reach far and wide and detect into the contiguity part of Body X. What is necessary is to arrange two or more detection electrodes 1 in the contiguity section of Body X, as shown in drawing 3 in doing in this way, and for lead wire 5 just to tie each detection electrode 1. In addition, even if such, it is not necessary to change the configuration of detector 2' at all.
[0015] The electrostatic-capacity type taking-a-seat sensor of the differential delayed type shown in drawing 1 as a taking-a-seat sensor of this example is used, and this taking-a-seat sensor forms the reference electrode 3 other than the detection electrode 1, and detects a taking-a-seat condition from the difference of the electrostatic capacity between the earths with each electrode 1 and 3. Here, in the case of this electrostatic-capacity type taking-a-seat sensor, the detection electrode 1 is formed in the part which Body X approaches, and a reference electrode is prepared in the part which Body X does not approach.
[0016] Detector 2' of the electrostatic-capacity type taking-a-seat sensor of this differential

delayed type the pulse generating circuit 21 which generates a pulse signal, the adjustable delay circuit 221 which generates the output delayed according to the electrostatic capacity between the detection electrode 1 and a reference electrode 3, and a ground, respectively in the output of this pulse generating circuit 21, and 222 each adjustable delay circuit 221 and 222 The waveform shaping circuit 231 which shapes an output in waveform, and 232 The delay equalization circuit 241 which only the amount of arbitration delays each waveform-shaping output, and performs offset adjustment of an output, and 242 It constitutes from a phase sensitive discriminator 25 which discriminates from the phase contrast of the output of each delay control circuit 24.

[0017] When the toilet bowl is not used, it is made to have not produced phase contrast by this taking-a-seat sensor depending on the electrostatic capacity between each of the detection electrode 1 and a reference electrode 3, and the earth. If people sit on the seat 30 now for a stool, since Body X intervenes between the detection electrode 1 and the earth, the electrostatic capacity between the detection electrode 1 and the earth changes. on the other hand, also when Body X sits on the seat, the electrostatic capacity between a reference electrode 3 and the earth is boiled so much, and does not change. For this reason, the adjustable delay circuit 221 and 222 The charge of delay of an output changes a lot, phase contrast is detected in a phase sensitive discriminator 25, and it is distinguished from this output that people sat down in the control circuit which consists of a microcomputer of a toilet bowl warm water flush system A etc. That is, by the electrostatic-capacity type taking-a-seat sensor S of this differential delayed type, taking-a-seat detection is performed from the relative difference of each capacity coupling by the side of the detection electrode 1 and a reference electrode 3.

[0018] Here, the above-mentioned reference electrode 3 is arranged into the part used as the same environment as the detection electrode 1. By the electrostatic-capacity type taking-a-seat sensor S of this differential delayed type, if it does in this way, since the relative difference of each capacity coupling by the side of the detection electrode 1 and a reference electrode 3 is searched for, the effect by temperature etc. will be offset and dispersion in a detection output will decrease. Furthermore, by the above-mentioned electrostatic-capacity type taking-a-seat sensor, the electrostatic-capacity change from the direction where it is not wished other than the detection direction may be detected, and malfunction may be caused. Then, what is necessary is just to intercept electrostatic-capacity association in the direction which is not required, in order to make it not make electrostatic-capacity change of the direction except performing body X detection cause.

[0019] In that case, what is necessary is just to shield between the detection electrode 1 and the detection direction which is not required. For example, in order to consider as the structure where the toilet bowl or waterdrop of the seat 30 are not detected, the screening electrode 4 grounded under the detection electrode 1 as shown in drawing 5 (a) is arranged. If it does in this way, unnecessary electrostatic-capacity association of the lower part of the seat 30 is intercepted, and taking-a-seat detection can be performed only in a required direction. Furthermore, it is still more desirable, if it considers as the structure which shields all the directions except the upper part with a screening electrode 4 as shown in drawing 5 (b).

[0020]

[Effect of the Invention] The detection electrode with which this invention is attached in the part which the body of the taking-a-seat section with which people sit down as mentioned above approaches, Since it has the detector which is the part which the body of the above-mentioned taking-a-seat section does not approach, and detects the taking-a-seat condition of the body from change of the difference of the electrostatic capacity between a detection electrode, the reference electrode attached in the bottom of the same environment, and each electrode and earth The ** which does not ask ** which is in the contact to the body and a detection electrode, and a non-contact condition if it is the part from which electrostatic capacity changes when people intervene between a detection electrode and the earth, A detection electrode can be attached in any locations and, for this reason, there is little constraint of an attaching position. And by taking the relative difference of the electrostatic capacity of a detection electrode and a reference electrode, and the earth, the same elements, such as an

environmental variation, can be offset and it is effective in the ability to prevent that the detection sensitivity of a taking-a-seat condition changes according to an environmental variation. [0021]

[0022] Furthermore, if the screening electrode which intercepts electrostatic-capacity association of the direction of [other than the direction where the body approaches] is prepared, electrostatic-capacity association in the direction which is not required can be intercepted, and a taking-a-seat condition can be detected only in a required direction.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the circuit diagram of the taking-a-seat sensor of one example of this invention.

[Drawing 2] It is the explanatory view of the arrangement approach of a detection electrode same as the above.
[Drawing 3] It is wide range and is the explanatory view of the arrangement approach of the detection electrode in the case of enabling it to detect the body.
[Drawing 4] It is the perspective view showing the toilet bowl warm water flush system to which the same as the above is applied.
[Drawing 5] (a) and (b) are explanatory views of an approach which prevent electrostatic-capacity association in an unnecessary direction.
[Description of Notations]
1 Detection Electrode
2' Detector
3 Reference Electrode
4 Screening Electrode
30 Seat
X Body

[Translation done.]